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MERCHANDISING STUDIES IN SUPERMARKETS--APPLES, LETTUCE, AND TOMATOES

(A Preliminary Report)

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Responsibility for the interpretation and analysis of the findings is solely that of the author.

MERCHANDISING STUDIES IN SUPERMARKETS-- APPLES, LETTUCE, AND TOMATOES

(A preliminary report)

by Hugh M. Smith, marketing specialist
Market Development Branch

BACKGROUND INFORMATION

To measure immediate consumer reaction in a large metropolitan area to alternative methods of merchandising apples, lettuce, and tomatoes, experimental tests were conducted in a selected group of 12 retail food stores of the supermarket type in Pittsburgh, Pa. 1/ Merchandising tests for these different commodities extended from October through December 1953, and February through May 1954. Alternative methods of merchandising were evaluated by measuring consumer purchases, using applications of rotational type experimental designs. The testing of alternative methods of merchandising for additional agricultural commodities is currently being carried out in additional supermarkets in Pittsburgh. The results of these current experiments will be released to the trade in preliminary reports as soon as they are available with an overall report covering in detail all commodities upon completion of this phase of research.

The retail merchandising research was a joint undertaking by Cornell University Agricultural Experiment Station, the Department of Agricultural Economics of the Pennsylvania State Agricultural Experiment Station, and the Agricultural Marketing Service, U. S. Department of Agriculture. In addition, a national food chain cooperated in this research by making its stores available as a laboratory for conducting these merchandising tests.

1/ Merchandising may be defined as including those activities surrounding the offering of commodities to customers, such as displaying, packaging, pricing, advertising, labeling, and other practices. The general objective of merchandising research is to determine the effect of alternative methods of merchandising on net returns to agencies concerned and to further the application or adoption of improved practices.

OBJECTIVES

As in the prior merchandising studies, the purpose of the retail store experimental researh in 1953-54 was to measure and evaluate the effectiveness of selected methods of merchandising apples, lettuce, and tomatoes, as reflected through volume of sales. The selection of merchandising methods used in the experimental test was confined to those believed to offer the greatest possibility of bringing about an improved retail merchandising program for fruits and vegetables.

The value of controlled experiments for testing alternative merchandising practices lies in the fact that results indicating the degree of consumer preference among different methods may be immediately useful in hastening acceptance of the more efficient and preferred merchandising methods. Information obtained from experimental tests, either positive or negative, may be valuable in eliminating undesirable practices at the retail level which, if allowed to continue, might adversely affect incomes to producers. The controlled experiment at the retail level is particularly useful in a dynamic market situation because consumer reaction to alternative practices can be accurately and quickly measured.

FINDINGS

Alternative methods of merchandising were evaluated by measuring consumer purchases using application of rotational type experimental designs to eliminate time and store differences.

Apples

Tests relating to the merchandising of apples were conducted by Cornell University over a period of several years before 1953. Most of these tests were in small towns in New York State. An important unanswered question concerned the application of the findings of these studies to large metropolitan areas and terminal markets.

In late 1953--from October 12 through December 5--an apple merchandising experiment was undertaken in a sample of 12 stores in Pittsburgh, a representative metropolitan area. The same sample of stores was used in subsequent experiments in the first half of 1954. Bulk sales were tested against package sales, and package sales units were tested in 3- and 5-pound polyethylene bags. Five-pound polyethylene bags were tested against 5-pound mesh bags. The total volume of sales of each treatment was compared for overall sales effectiveness of each individual merchandising method.

In the 1953 study the tests were conducted over an 8-week period, with each treatment maintained in each store for a period of 2 weeks, only eastern general-purpose apples were included, and usually only one variety was

offered at any one time. Both bulk and bagged apples were sold at the same price. The results of the 1953 tests were as follows: eastern apple sales ranged from a high of 20 pounds sold per unit of 100 customers in displays of 5-pound mesh bags, with bulk (that is, a display including both package and bulk apples), with a 5-pound price unit, to a low of 12 pounds sold per unit of 100 customers in displays of bulk with a 3-pound price unit (table 1). Sales from displays of 5-pound mesh bags, with bulk, with a 5-pound price unit were not significantly different from sales from displays of 5-pound polyethylene bags, with bulk, with a 5-pound price unit.

Table 1.- Quantity of apples sold by specified methods in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising methods	Sales per 100 customers 2/
	Pounds
Bulk with a 3-pound price unit	12.0
Three-pound polyethylene bag, in combination with bulk, with a 3-pound price unit	16.5
Five-pound polyethylene bag, in combination with bulk, with a 5-pound price unit	19.0
Five-pound mesh bag, in combination with bulk, with a 5-pound price unit	20.0

1/ Includes four 2-week test periods, October 12-December 5, 1953.
2/ The 3-pound combination displays sold 38 percent more apples than bulk alone, while the 5-pound combination displays sold 63 percent more than the bulk alone. There was no significant difference between sales when apples were displayed in the following two ways: (1) in 5-pound purple mesh bags in combination with bulk, and (2) in 5-pound polyethylene bags in combination with bulk.

In the apple merchandising experiment conducted early in 1954, the commodity was displayed in combinations of bulk and polyethylene bags (plain and printed), with variations in bag weights and pricing units offered consumers (table 2).

Table 2.- Quantity of apples sold per 100 customers by specified methods in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising methods	Sales per 100 customers 2/
	Pounds
Plain polyethylene bags, of weights varying from 2 to 6 pounds, in combination with bulk, with a 3-pound price unit	10.75
Printed polyethylene bags of 5 pounds, in combination with bulk, with a 5-pound price unit	9.90
Plain polyethylene bags, of weights varying from 2 to 6 pounds, without bulk, with a 3-pound price unit	9.78
Plain polyethylene bags of 5 pounds, in combination with bulk, with a 5-pound price unit	8.92

1/ Includes four test weeks, February 15 to March 13, 1954.
2/ The difference between averages is statistically significant for the largest and the smallest figures; other differences are not statistically significant at the 5-percent confidence level.

Of the merchandising methods tested in this experiment, the findings indicated that more apples were sold per 100 customers with a display of plain polyethylene bags with weights varying from 2 to 6 pounds "catch weight," in combination with bulk, and based on a 3-pound pricing unit. Displays of a printed 5-pound polyethylene bag offered in combination with bulk, and based on a 5-pound pricing unit, resulted in the second largest quantity of sales. However, among the four merchandising methods tested, a statistically significant difference 2/ prevailed only when the method of displaying apples in a plain polyethylene bag with weights varying from 2 to 6 pounds in combination with bulk and based on a 3-pound pricing unit was compared to the method of merchandising apples in a plain 5-pound polyethylene bag in combination with bulk and based on a 5-pound pricing unit. The data indicate a distinct preference prevails for a choice of 2- to 6-pound "catch weight" bags of apples offered in 3-pound pricing units.

2/ Five-percent confidence level.

In the 1954 test, about 85 percent of the apples were sold in bags when a combination of bulk and bags were displayed. When consumers were offered a choice of bag weights ranging from 2 to 6 pounds, the largest proportion of purchasess was made in 3- and 4-pound bags.

Of the total quantity of apples handled during the 1954 test, in the experimental stores 4 percent was lost through spoilage. The largest percentage of this spoilage occurred in bulk display--to a large extent, from customer handling.

Lettuce

Lettuce was offered consumers by three types of displays--bulk, cellophane bags, and banded, which consisted of a semimetal tape around the head of lettuce (table 3). Bulk lettuce was sold at both the 1- and 2-head price. Lettuce in cellophane bags and banded was sold at a unit price announced for all stores. No comparison of methods was made between bulk sales of lettuce at different unit prices. The bulk lettuce display, with a 2-head pricing unit, proved to be the most successful method of merchandising lettuce among those methods tested, based on sales per 100 customers. However, the practice of selling lettuce in cellophane bags proved almost equally as successful a method of merchandising.

Table 3.- Quantity of lettuce sold per 100 customers by specified methods in 12 food chain stores, Pittsburgh, Pa. 1/

Merchandising methods	Sales per 100 customers 2/
	Number of heads
Bulk, 2-head price	14.12
Cellophane bag, 1- and 2-head prices	14.11
Bulk, 1-head price	13.61
Banded with a semimetal tape, 1- and 2-head prices	12.58

1/ Includes 4 test weeks (every other week) beginning March 22, 1954.
2/ The first two figures are significantly different from the last, but not from the third at the 5-percent level.

the product. The difference between these two methods was not statistically significant at the 5-percent confidence level. 3/ Both the method of displaying lettuce in bulk, with a 2-head pricing unit, and in cellophane bags, resulted in a greater volume of sales than the method of selling lettuce wrapped in semimetal bands.

Sharp upward changes occurred in the price of lettuce during the period of this experiment. These price increases may have reduced considerably the quantity of lettuce sold per 100 customers.

Of the quantity of lettuce handled in the experimental stores, 12 percent was lost through spoilage, with the largest percentage of spoilage occurring prior to display for sale.

Tomatoes

Merchandising methods for tomatoes involved the use of the standard cardboard tube of 3 and 4 tomatoes and a plastic tube at a 3-cent premium, affording a full view of the tomatoes (table 4). Merchandising displays offered consumers various combinations of tubes of 3 and 4 tomatoes, with and without bulk. Retailing tomatoes in plastic tubes, based on sales per 100 customers, proved to be the most acceptable merchandising method, even with a 3-cent price premium. Although more tomatoes were sold when offered in plastic tubes, there was no statistical significance among differences at the 5-percent confidence level in volume of sales among any of the methods tested.

When a combination display of tomatoes in standard tubes and bulk was offered consumers, 94 percent were sold in tubes as compared to 97 percent when plastic tubes were offered in combination with bulk.

Spoiled tomatoes accounted for 3 percent of the total quantity handled in the test stores. A much lower percentage of spoilage occurred in the merchandising methods displaying the plastic tubes.

3/ A 5-percent confidence level test insures that two methods that are equally successful will be judged significantly different because of observed differences in their means in only 5 percent of cases.

Table 4.- Quantity of tomatoes sold per 100 customers by specified methods in 12 food chain stores, Pittsburgh, Pa.

Merchandising methods	Sales per 100 customers 1/
	Pounds
First test 2/	
Plastic tubes of four tomatoes (with a 3-cent price premium	6.30
Regular tubes of three and four tomatoes	6.10
Regular tubes of four tomatoes	6.07
Regular tubes of four tomatoes, with bulk	5.90
Second test 3/	
Plastic tubes of four tomatoes, with bulk (with a 3-cent price premium)	8.38
Plastic tubes of four tomatoes (with a 3-cent price premium)	7.98
Regular tubes of four tomatoes	7.52
Regular tubes of three and four tomatoes	7.42

1/ For each method tested, differences between averages are not statistically significant at the 5-percent confidence level.
2/ Includes four test weeks, February 15 to March 13, 1954.
3/ Includes four test weeks (every other week), beginning March 15, 1954.

METHODOLOGY

The basic rotational latin square technique 4/ was used in the experimental testing of alternative methods of merchandising apples, lettuce, and tomatoes. By rotating the merchandising methods being tested from store to store, the

4/ Certain refinements and additions were made to the basic design, including the graeco-latin square. The design for the 1954 test on apples and the first experiment on tomatoes was a modified latin square which provided for a measurement of carryover effects. However, the analysis indicated the absence of any carryover effects in treatments for apples and tomatoes.

effect on retail sales of nontest variables--differences in size and type of stores, seasonality in demand, competition from other products, and differences in preference of customers among stores--was equalized. The effect of certain other variables on the volume of sales was eliminated by holding the variables constant throughout the experiment in all test stores. 5/ The size, location, and display for each commodity--apples, lettuce, and tomatoes--were kept constant throughout the test periods by prior arrangement with officials of the chain store. Pricing and advertising policies for the commodities tested were uniform for all stores included in the experiment. In addition, changes in retailing procedures for competing fruits and vegetables were likewise kept as uniform as possible within the experimental stores. The coordination of retailing practices applying both to experimental and nonexperimental commodities was made possible by all stores being under the same chain store management.

The experimental test period for the 1953 apple test was of 8 weeks' duration. The experimental test periods for the 1954 apple, lettuce, and tomato tests were of 4 weeks' duration each. Using the rotational latin square design, four methods of merchandising were tested for each commodity in 12 stores (table 5). Each merchandising method in each store was rotated each time period so that after four time periods, every merchandising practice had been tested during one of the four time periods in all 12 stores. The basic design was replicated three times in each period by application to 3 sets of 4 stores, or a total of 12 stores, each experimental period.

Table 5.- The latin square design used in measuring the effect of specified merchandising methods on retail sales of selected commodities

Time period	Stores			
	1	2	3	4
1st	1/ A	B	C	D
2nd	B	C	D	A
3rd	C	D	A	B
4th	D	A	B	C

1/ Alphabetical letters in this design represent specified merchandising methods.

5/ Methods of Research in Marketing, Paper No. 1, Department of Agricultural Economics, Cornell University Agricultural Experiment Station, Ithaca, N. Y., pp. 36-391. 1951.

By rotating each merchandising method tested among the stores, time and store differences were eliminated. Merchandising methods selected to be tested for each commodity were randomized by store and time periods within the design.

The 12 experimental stores in which the merchandising experiments were conducted were matched in size and type as nearly as possible. However, they were not identical in all respects, especially in the number of customers normally patronizing the different stores. To compare the effectiveness of the various merchandising methods tested within a given experiment in the 1953-54 tests, the number of pounds of apples and tomatoes sold by each method was converted to the number of pounds sold per unit of 100 customers. Lettuce was converted to the number of heads sold per 100 customers.

The analysis of variance technique 6/ was used in analyzing the data to obtain and assign the existing variation to specific components. The honestly significant difference test 7/ was used in the 1953-54 tests to interpret the statistical significance of this variation. In this study the components were time periods, stores, merchandising methods, and experimental errors.

Data were gathered under normal store operating conditions. Consumers were exposed to only one merchandising method in a store at a time for the particular commodity being studied.

Usually an enumerator was assigned to two stores. Enumerators were responsible for maintaining the displays in the prescribed manner for each merchandising method, according to the rotation schedule. In addition, they collected records of sales, spoilage, and other data and obtained a cash register count of those customers potentially exposed to the merchandising method being tested.

6/ Snedecor, George W. Statistical Methods. The Iowa State College Press, Ames, Iowa, 1948, pp. 271-85.

7/ Tukey, J. W. The Problem of Multiple Comparison. (Unpublished manuscript.) Princeton University.